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Reconsidering Higher Animal Intelligence

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HUMAN AND NONHUMAN: RECONSIDERING HIGHER ANIMAL INTELLIGENCE

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Dedication:

To my friend, brother, and elder

kopo nika Sikhs Kahpho
Gene Wiggins Cowlitskee
kopa hwah nesika ko kopo Chitsh Illahee
pee nanitsh nesika kotsuk kopa Kloshe Hyas Saghalie Tyee Mamook

dolphin and chimpanzees who were physically agile and mentally alert. Who among these groups of God's creatures possesses a greater quantity of "person" signs and behaviors? This manuscript does not propose definitive answers to such questions. In fact, my intention in this manuscript is to befuddle somewhat your affect and your intellect. That is, I hope to lessen your feelings of species superiority, and to raise uncertainties in the rational arguments on which you rely. My ultimate hope is for a greater humility in our attempts to find our place in the immensity of God's creation. In content, my intention is to provide an alternative conceptualization to the humanism of so many of my colleagues who are philosophers and theologians (i.e., humankind is the ultimate creation in God's universe) (e.g., Thomas, 1985). My intention also is to provide an alternative conceptualization to the reductionism of others who are neurophysiologists, ethologists, and sociobiologists (i.e., humankind is no more than a species of animal to be understood according to its neuroanatomy and genetic history)(e.g., Popper & Eccles, 1977; Eibl-Eibesfeldt, 1975; Wilson; 1975; 1978). My intention is to argue that at least in higher animals, species specific intelligences and world views exist which are distinct from human intelligence and world view. And that attempts to assess these intelligences and world views in categories that make sense to us humans are nonsensical.

I intend to provide this alternative conceptualization by first surveying models of human-animal relations; second, briefly reviewing the research on higher animal intelligence; third, critiquing this literature according to cross-cultural methodology; and fourth, exploring the possibility of complex non-human realities, which include among perceptions and

cognitions, relationships to the God of creation.

Models of Human-Animal Relations

In a previous manuscript I proposed a variety of behavioral science models in an attempt to understand how humans value animals (Roe, 1982). I briefly will review a few of these and then focus in greater depth on the Speciescentric and on the Cognitive Models, as they are more relevant to the present analysis.

Social Psychological Model: The sub-area of social psychology of particular relevance to human/animal relations is prejudice development and stereotyping (see Allport, 1954; Aronson, 1980). Prejudice has been defined as a negative attitude toward a specific identifiable group based on generalizations derived from faulty or incomplete information (Aronson, 1980); and stereotyping has been defined as generalizing characteristics or motives to an entire group of individuals regardless of actual variation within the group. Its function is to justify or rationalize conduct in relation to that group (Allport, 1954; Aronson, 1980). An example of both may be found in the 1904 game laws of Kenya (Rensberger, 1978). Prejudice was evident in the categorizing of baboons as vermin simply because of the misperception (i.e., stereotype) that they were repulsive.

A variety of theories have been proposed to explain the development of prejudice; they are not mutually exclusive, although their explanatory strengths vary. For example,

visibility and strangeness theories posit that visible differences imply "real difference." Thus, there may be more public sympathy for the current plight of the snow leopard, than there was for the snail darter, since the snail darter, as a fish in isolated habitats, was perceived as more different than a terrestrial mammal. Displaced aggression or "scapegoat" theory argues that individuals displace aggression onto groups that are visible, relatively powerless, and often disliked to begin with. For example, with inflation and unemployment we see a greater frequency of child abuse; I would venture that if the data were available, we would also see a greater frequency of pet abuse for the very same reasons. Exploitation theory has Marxian origins and states that a group is stigmatized as inferior so that exploitation of the group itself or its resources can be justified by the oppressor. Certainly this theory could be applied to some of the arguments used in support of experimentation on lab animals. A final example is competition theory; that is, competition between groups for the same limited resources can result in negative attitudes and actions. For instance, Dutch settlers during the colonization of South Africa decimated the indigenous white-tailed gnu (antelope), reasoning that there would be more grazing room for their domestic livestock (Durrell, 1973). Today's confrontations between environmentalists and the lumber industry over the old growth forest habitat of the spotted owl likely fit this theory, as well.

Ethological Model: Ethology is the comparative study of behavior; more specifically, it is the study of phylogenetic adaptations which are hypothesized to influence behavior in animals in a definable manner (Eibl-Eibesfeldt, 1975). A focus on human

behavior primarily has been the result of theorizing among sociobiologists (e.g. Barash, 1977; Wilson 1975; 1978). Their basic premise is that homo sapiens is "a typical animal species with reference to the quality and magnitude of the genetic diversity affecting its behavior" (Wilson, 1978, p. 6). This influence includes complex forms of social behavior, where genetic effects are hypothesized to be evident on learning modes, cognitive and neuromuscular ability, personality traits, and so on.

What biological basis can be argued for human behavior towards animals? One example is the possibility of innate releasing of nurturant and affective responses to infant-like cues. Lorenz (discussed in Eibl-Eibesfeldt, 1975) delineates a number of such key stimuli, including large head in proportion to body, large eyes below midline of the head, and rounded body shape with soft elastic surfaces. It is hypothesized that animals which display such physical characteristics (e.g., the koala bear) are more likely to be valued by humans, than those which do not.

Biological influence has also been implicated in body posturing/communicating across human cultures, and across human and animal species. One example is the homologies in facial expression noted across monkeys, great apes, and human beings (Eibl-Eibesfeldt, 1975).

Cultural Values Model: This model proposes that we value animals which display behavior congruent with our cultural sanctions. For example, with our focus on the

Western cultural traditions of nuclear family and monogamy, we have a certain affinity for animals which pair bond for life, such as the oilbird of Trinidad. We claim that "cleanliness is next to godliness," and so look kindly on apparent washing behavior of the raccoon and Japanese macaque.

Utilitarian Model: The basic assumption of this model is that animals are valued because of their utility to human beings. This is most obvious in regards to the dimensions of food and/or work. However, other dimensions exist, such as animals' value in an ecosystem (e.g., Ronald & Dougan, 1982; Norman, 1981), and the more recently recognized dimension of animals' psychological value. It is proposed that as part of nature, animals have aesthetic value to humans (Rensberger, 1978), and as pets and companions, animals have physical and emotional health value to humans (Holden, 1981).

Speciescentric Model: This is a general model which crosses the lines into other models. Its basic premise is that humans, as a species, transcend the animal kingdom; they live and behave according to a different set of rules. This is a common theme in literature; returning to C.S. Lewis (1950), in The Lion, the Witch, and the Wardrobe, for example, Narnia is depicted as the land of talking beasts which cannot return to stability until human rulers are on the throne. In Kipling's (1961) The Jungle Books, Haithi the elephant is recognized as the master of the jungle, yet the feral child, Mowgli, truly rules because he is human.

Such a model is evident in the research literature, as well. Griffin (1981) says of those studying animal cognition, "This belief that mental experiences are a unique attribute of a single species [homo sapiens] is not only unparsimonious; it is conceited" (p. 170). Sarles (1982) argues that speciescentrism is demonstrated in research requiring animals to solve human types of reasoning problems, and to learn human language. Perhaps humans should take the initiative to enter another species' world, as suggested by Lorenz (1952) in the following vignette.

> Then suddenly, through the drowsy dimness of my senses, I heard Alfred say, in an irritated tone: "Rangangangang, rangangangang--oh, Sorry, I mean, quahg, gegegegeg, Quahg, gegegeg!" I woke laughing: he had wanted to call away the mallards and had, by mistake, addressed them in greylag language (p. xvii).

Theological underpinnings also exist for speciescentrism. Black (1970) argues that some interpret the Biblical account of creation as supporting a nature created for humanity's purposes. Put more vehemently by White (1967):

> Despite Copernicus, all the cosmos rotates around our little globe. Despite Darwin, we are not, in our hearts, part of the natural process. We are superior to nature, contemptuous of it, willing to use it for our slightest whim (p. 1206).

Cognitive Model: In the previous discussion on prejudice development, one theory was presented that assumed visible differences carried the implication of real differences. A similar conception is Rokeach's belief prejudice theory (Rokeah, Smith, & Evans, 1960), in which a member of another group is assumed to have beliefs and values which are dissimilar to one's own. It is this believed incongruence which results in hostile reaction.

The cognitive model is based on such theories. Our culture places great emphasis on intellect as a definer of an individual; indeed, it is used as evidence of personhood. (Consider our sordid history of eugenics based racism.) The cognitive model presupposes that the closer an animal's intellect is to the human's, the closer that animal is to personhood, and the more similar that animal is to me (from Rokeach's theory). This is illustrated in Figure 1's continuum of mental experience. (See next page.)

Although learning has been demonstrated, and thought proposed, in invertebrates and non-mammalian vertebrates (e.g., Gould & Gould, 1986; Griffin, 1981; 1984; Thomas, 1986; Walker; 1983), these animals are presumed so far removed from humans on the gradient of mental experience, that the cognitive model is seldom employed. Arguments of cognitive similarity are most often used with higher mammals such as great apes, dolphin and whales. In fact, extreme applications of this model have been provided by those who equate human and animal, such as Temerlin (1972), who literally considered his home-raised chimpanzee as his daughter, and Garner who wrote of the chimpanzee, Moses:

> He deserves to [live in history], because he was the first of his race that ever spoke a word of human speech; because he was the first that ever conversed in his own language with a human being; and because he was the first that ever signed his name to any document. Fame will not deny him a niche in her temple among heroes who have led the races of the world (Garner, 1900).

Some even place humans in a subordinate position to animals, as does Lilly (1967; 1982) in his work with dolphins.

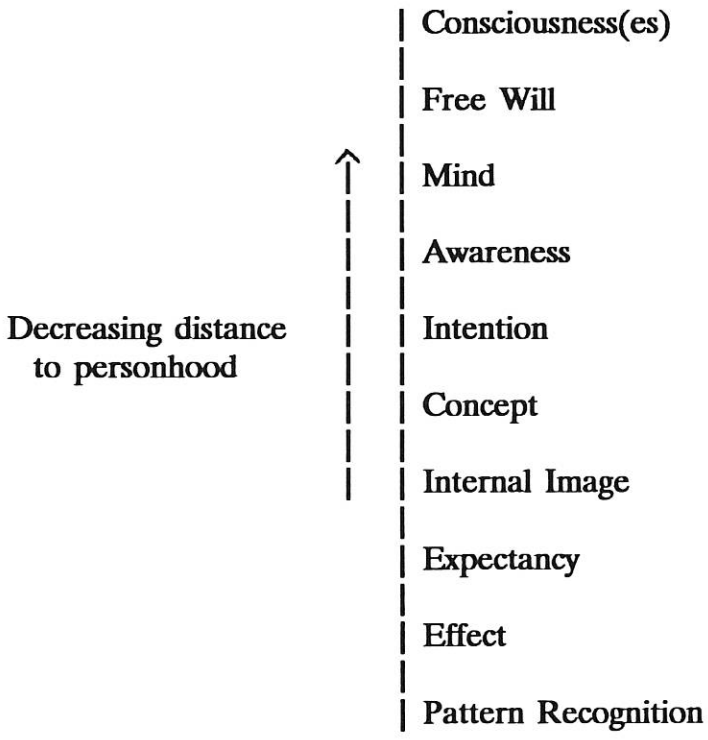

Figure 1. Gradient of animal mental experience. (Adapted from Griffin's (1981, p. 114) gradient of acceptability.)

This model of an animal awareness continuum raises a major ethical dilemma. If the defining distinction between humans and animals is not one of a kind, but of degree as proposed by this model, then the distinction between "person" and "thing" falls (Adler, 1967, pp. 257-258). The result is no argument may remain for differential treatment of humans and animals--except expediency. This dilemma is being voiced today by those asking whether chimpanzees have human rights (Stone & Koebner, 1982), and is explicitly demonstrated in the case of the mountain gorilla, Koko. As a sick infant, Koko was borrowed from a zoo, raised and taught sign language by Francine Patterson (1976; 1978) at Stanford University. When the zoo asked for Koko's return, the argument was made that since Koko had learned language, it would be morally wrong to define her and manage her as a zoo animal (Griffin, 1981). Apparently, the zoo was financially reimbursed.

It is unlikely that any single model of human-animal relations is sufficient to explain and/or predict behavior; rather multiple and interacting models are more feasible. To illustrate, consider the controversial hunting of Harp seal pups (see Ronald & Dougan, 1982). Hunters of the pups are harvesting pelts for non-essential human consumption; they also claim the activity is part of their heritage. It would appear that both of these factors fit the speciescentric model. In addition, the hunters earn a portion of their yearly income from pelt sales, and they claim that they are managing the Harp seal population to the benefit of the local ecosystem. Both of these factors appear associated with the utilitarian model.

In contrast, environmentalists opposing the hunt personally respond to and effectively use the picture of the baby seal in their P.R. campaigns. Characteristics of the seal pup act as releasing stimuli for nurturant behavior; thus, the ethological/sociobiological model is relevant. Pups are clubbed while they are still suckling, since following weaning, they molt their prized white coat. Thus, mother Harp seals are in the vicinity. Again, environmentalists personally respond to and publicize the alleged "agony" of mothers watching the clubbing and skinning of their young. Considering our culture's high value on child-parent bonding, this forced separation of mother seal from pup directly relates to the cultural values model. Finally, opponents of the hunt also use the utilitarian model; however, unlike proponents, they argue that the ecosystem is being violated.

Studies of Higher Animal Intelligence

As mentioned in the Cognitive Model, perception of similarity/dissimilarity may affect how one relates to another organism. It has been the claim of qualitative dissimilarity (i.e., difference in kind) that has permitted our justification of animal exploitation (see Adler, 1967). Figure 2 lists the more common attributes historically used to distinguish animals from humans. These attributes will be briefly discussed in light of past and present comparative research, with a primary, though not exclusive, focus on great apes.

Tool Using	**Past**
Tool Making	
Reasoning	
Culture	
Self Consciousness	
Language	**Present**

Figure 2. Past and present attributes commonly used to distinguish animals from humans.

Relation to tools: Tool using has been observed in a wide variety of organisms from insects to higher primates (Wilson, 1975). For example, solitary wasps pound shut their nest entrance with a mandible held pebble; a number of Darwin's finches use twigs, cactus spines, and similar materials to dig insects out of cracks in tree bark; the Egyptian vulture hurls rocks with its beak to break ostrich eggs; while floating on its back, the sea otter cracks various mollusks against stones or shells placed on its stomach; chimpanzees use sticks as clubs and projectiles in attacking perceived predators.

Tool making indicates higher levels of cognitive functioning and adaptation. This has been demonstrated by chimpanzees in stripping stems or twigs to fit in insect holes and in chewing leaves to form sponges to sop up water otherwise inaccessible (van Lawick-Goodall, 1971).

Adaptive Learning and Problem Solving: Kellogg (1968a) summarized the work of six major research projects in rearing young chimpanzees in experimental homes between 1932 and 1968. He reported that chimpanzees adapted well to home environments, accepting clothing with little more objection than a child. The chimpanzees proved to be good activity imitators though not as great as children. The chimpanzees reacted to visual pictures and to photographs as did children, and produced drawings similar to children at young ages, although the chimpanzees never progressed to image-formation. Even in toilet training, after an initial lag, the chimpanzees were similar to children for the period of observation.

Some of the first direct investigations of chimpanzee mental functioning focused on tool utilization in problem solving. Kohler's (1925) celebrated chimpanzees, for example, demonstrated apparent reasoning ability in increasing their length of reach by joining the ends of two sticks, by building a tower of boxes on which to climb, and combining both these strategies in reaching with a stick from a box tower. Similarly work by Hayes and Hayes (1952) indicated that their home-raised chimpanzee performed comparably to human children of similar age in utilizing imitation for problem solving. The problems solved included using a stick to push a lure out of a tunnel, using a ball to knock down a hanging lure, operating a toggle switch to release a hanging lure, manipulating a stick to displace a string which opened the door of a box, utilizing a candle to burn a string to open the door of a box, and pulling levers in a sequence to open a door. A modern day

extension of these early studies was performed by Savage-Rumbaugh, Rumbaugh, and Boysen (1978). In this study, two chimpanzees communicated with each other through a computer-controlled language to cooperatively solve a problem related to gaining food through tool utilization. By the way, at the successful completion of the session, the chimp who obtained the food shared it with his co-worker.

Additional studies into the reasoning skills and other higher mental functions of apes have demonstrated indirect problem solving by working with representations of problem situations and solutions (Premack & Woodruff, 1978), intermodal equivalence of stimuli through non-symbolic matching tasks (Davenport & Rogers, 1970), symbolic intermodal perception through the use of language instructions (e.g., "give me one that looks like this") (Savage-Rumbaugh, Sevcik, & Hopkins, 1988), concepts of number and proportion (Cowen, 1981), picture reconstruction including the introduction of a novel representational element (Premack, 1975), gross and subtle classification systems (Mason, 1976), and so on. These data lead Mason (1976) to conclude that great ape and human mental structures of reality appear to be quite similar, and what differences exist appear to be in degree rather than kind. In fact, when the then 4 year old gorilla, Koko, was administered the Stanford-Binet Intelligence Scale, she scored in the low average range of human norms for her chronological age (Patterson, 1978). In another study, utilizing Piaget's cognitive-developmental model, Chevalier-Skolnikoff (1981) argued that language trained apes have demonstrated cognitive skills fulfilling at least all 6 stages of the human sensorimotor period.

Although far fewer studies have been performed, cognition and problem solving have also been investigated in dolphin. Dolphin have demonstrated complex auditory and visual learning, and consistently demonstrated the ability to develop and apply rules to entire classes of problem situations (Herman, 1986). Dolphin also demonstrated notable capabilities for both vocal and motor mimicry (Herman, 1980; 1986; Lilly, 1967); an ability which Herman (1986) believed is evident in no other nonhuman species.

Culture: In discussing animal culture, definitional issues become problematic. I will utilize Bonner's (1980) concept of animal culture and Mundinger's (1980) concept of animal tradition to define culture as learned behavior shared within a generation and passed to future generations, with transmission due primarily to modeling and imitation. Direct tuition may be a part of the process, as well.

Much evidence in a variety of species exists for such a concept of culture. A few examples will follow. Titmice in a single location in Britain learned to peck through the aluminum foil caps on milk bottles to gain access to the cream on top. This behavior eventually spread over the entire British Isles (Bonner, 1980). The celebrated Koshima troop of Japanese macaques clearly demonstrated cultural transmission of three behaviors: washing potatoes, water play and swimming, and using water to "placer mine" grain from sand. The direction of transmission tended to be from juvenile to juvenile to adult to next generation infants (Bramblett, 1976). Differences in tool utilization between chimpanzee troops in the wild have been interpreted as culturally diverse traditions; i.e., cross-cultural

differences (Goodall, 1986). Critics question whether examples such as these are truly demonstrations of culture, since they lack evidence of symbolic processes. In recognition of this limitation, the term "proto-cultures" is sometimes applied (Tuttle, 1986, p. 146).

If symbolic processes are considered necessary for true culture to be demonstrated, then Fouts and his colleagues (Fouts, 1982; Fouts, Hirsch, & Fouts, 1982; Fouts, 1987) provide examples of true culture in his studies of language transmission in chimpanzees.[2] In 5 1/2 years Loulis, originally a naive infant chimpanzee, acquired over 60 signs through interaction with Washoe, his sign trained adoptive mother. This transmission of symbolic information occurred through three processes: First, manual "babbling" which was hand play with a sign or part of a sign; second, direct imitation of signs produced by other sign competent chimps; and third, direct teaching by Washoe. An example of this third process follows.

> Washoe was observed to sign food repeatedly in an excited fashion when a human was bringing her some food. Loulis was sitting next to her watching. Washoe stopped signing and took Loulis' hand in hers and molded it into the food sign configuration and touched it to his mouth several times (Fouts et al., 1982, p. 183).

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[2]Others argue that culture can only be demonstrated if cultural artifacts are in evidence; however, a basic problem exists in identifying what is an artifact. A species whose reality is alien to ours may produce cultural artifacts which are not recognizable by humans. A similar problem is raised by space scientists who are searching for signs of extraterrestrial intelligent life.

Self Consciousness: Gallup (1970; 1977; 1987) conceives of self consciousness as bidirectional: having an experience, and being aware of having an experience. In experiments using mirror images, he and others have demonstrated self recognition in some great apes, but not in lower primates. He hypothesized that great apes have bidirectional concepts of self, while lower primates have unidirectional concepts of self. Apparently social contact is necessary for bidirectional consciousness, and the species with which the contact occurs affects the resulting concept. For instance, chimpanzee Washoe when first confronted with other chimpanzees did not recognize them as conspecifics, but called them "black bugs" (Linden, 1974, p. 10). Home-raised chimpanzee Vicki classified herself as human rather than animal (Hayes & Nissen, 1971), and home-raised chimpanzee Lucy showed little interest in print or televised pictures of conspecifics, but great interest in pictures of nude human males when she was in estrus (Temerlin, 1975). In contrast, gorilla Koko was not home-raised and spent a good portion of her early years with another gorilla. When asked if she was an animal or human, Koko responded, "Fine animal gorilla" (Patterson, 1978, p. 465).

Language: Records of speech training in the chimpanzee go back to the late 1800's with Garner and the one year old chimpanzee mentioned earlier, Moses (Garner, 1900). Garner had little success, but closed his description of Moses' speech acquisition with his belief that had the chimpanzee lived a longer life (Moses died shortly after speech training began), he would have mastered words of human speech "to the satisfaction of the most exacting linguist" (Garner, 1900, pp. 137-139). Over the next 50 years, other major

attempts at teaching human speech to chimpanzees were attempted (e.g., Yerkes, 1925; Kellogg & Kellogg, 1933; Hayes, 1951); however, only a handful of recognizable words were ever produced. These failures were not related to limitations in chimpanzee cognition; they were related to anatomical structures lacking the articulatory maneuvers necessary to produce the full range of human speech (Kelemen, 1948; Lieberman, Klatt, & Wilson, 1969).

The spontaneous use of gesture movements by chimpanzees provided a different medium for communication between humans and apes (Kellogg, 1968b); in fact, in home raised chimpanzees, this tended to be the preferred means of communication (Hayes, 1951; Kellogg & Kellogg, 1933). It was this realization which lead to the early manual forms of communication: sign language (e.g., Fouts, 1973; Fouts, Mellgren, & Lemmon, 1973; Gardner & Gardner, 1969; 1971; 1975), manual manipulation of plastic tokens which represented lexical elements (e.g., Premack, 1971a; 1971b; 1974), and manual manipulation of computer consoles displaying lexical symbols (e.g., Rumbaugh, Gill, & von Glasersfeld, 1973; 1974).

Over the past 15 to 20 years research on language acquisition in apes has expanded beyond that first question of "Can apes utilize symbols to communicate?" to "natural" acquisition of language through cross-fostering infant chimpanzees from birth in sign rich environments (e.g., Drumm, Gardner, & Gardner, 1986; Gardner & Gardner, 1985; 1988), ape to ape symbolic communication (e.g., Fouts, Fouts, & Schoenfeld, 1984), spontaneous

symbol acquisition by apes in communicating with humans (e.g., Savage-Rumbaugh, McDonald, Sevcik, Hopkins, & Rubert, 1986), spontaneous symbol acquisition by apes in communicating with other apes (e.g., Fouts et al., 1982), and so on.

Twenty years of research on language acquisition in apes has lead to the following conclusions. One, apes can learn large vocabularies of representational elements. Two, apes combine representational elements into meaningful statements (i.e., they demonstrate semantics). Three, apes use representational elements to communicate beyond requests or comments concerning immediate needs (e.g., Fouts & Bodamer, 1987). Four, apes use representational elements to create novel utterances. Five, apes use representational elements to communicate with humans.

Penny: What did you do to Penny?

Koko: Bite.

Penny: You admit it?

Koko: Sorry bite scratch.

Koko: Wrong bite.

Penny: Why bite?

Koko: Because mad.

Penny: Why mad?

Koko: Don't know (Patterson, 1978, p. 459).

Six, apes use representational elements to communicate with other apes.

> Early this year Mike [Gorilla] was fumbling for the right sign to convince Ann [Human] to let him in to play with Koko [Gorilla]. After Mike signed, "Out," Koko, waiting in her own room, began to get impatient. She signed to Mike through the wire mesh, "Do visit Mike hurry, Mike think hurry," imploring him to come up with the right sign. Then she signed, "Koko good hug," and it finally dawned on Mike to sign, "Koko." A relieved Koko signed, "Good know Mike," and then, "In Mike" (Patterson, 1978, p. 465).

In spite of the obvious anthropomorphic interpretations of Koko and Mike's motivations, meaningful representational communication clearly was occurring between these two apes.

A recent and very promising area of language acquisition study is with pygmy chimpanzees (Pan paniscus), as in contrast to the much more frequent research with common chimpanzees (Pan troglodytes).

> Recent studies of this species have shown that, unlike other apes, pygmy chimpanzees acquire symbols without training. Like children, they comprehend symbols before they begin to produce them. Not only can they comprehend and use graphic symbols, they can also comprehend human speech. Unlike other chimpanzees, they do not seem to acquire symbols piecemeal. The representational aspects of symbol usage are easily grasped, with no training required. They are able to utilize symbols properly with the referent absent and to differentiate between naming and requesting without

> being trained to do so. They show definite concordance between symbol usage and their nonverbal behavior. They appear to have the capacity to construct a rudimentary grammar (Savage-Rumbaugh, 1987, p. 214).

Similar to research on cognition and problem solving, far fewer studies on language competence in dolphin have been performed than in apes. In contrast to the ape research in which language production has been heavily emphasized, the dolphin research has focused most heavily on language comprehension, since language production does not necessarily imply language comprehension (Herman, 1980; 1986). The artificial languages utilized with dolphin included a variety of features of natural language.

> The lexicon of the artificial languages was open and new words could be added to the vocabulary as desired; the symbols for words were arbitrary and generally not iconic; the words could be combined, and recombined, according to the dictates of a set of syntactic rules, into a very large number of uniquely meaningful sentences. Also, tacit knowledge of the syntactic rules underlying the language was necessary for a correct interpretation of the grammatical function of the lexical items in a sentence (Herman, 1986, p. 246).

Dolphins clearly were able to process both semantic and syntactic features of sentences in both acoustic and gestural languages. Dolphin were able to learn different grammatical rules for the two different language modalities. Finally, dolphin were able to understand novel sentences and novel structures (Herman, 1986).

Not surprisingly, this area of inquiry has a multitude of critics (e.g., Prescott, 1981; Pryor, 1981; Sebeok & Rosenthal, 1981; Sebeok & Umiker-Sebeok, 1980; Seidenberg & Petitto, 1981; Terrace, 1981; Terrace, Petitto, Sanders, & Bever, 1979). Most critics argue that at least among apes, the animals fail to demonstrate clear syntax in their utterances (i.e., syntax which is similar to standard English); that the apes, and in some cases the dolphin, are simply responding to operant conditioning techniques; that the apes' utterances are limited to immediate needs or desires; and that the methodologies used to study the acquisition of language by apes, and again in some cases by dolphin, inadequately control for human influences, in particular human cuing of animal responses.

This final criticism is referred to as the "Clever Hans Phenomenom" (see Sebeok & Rosenthal, 1981), and it is a dominant theme not only in the literature critical of language acquisition in animals, but also in the literature critical of higher cognitive processes in animals. Clever Hans was a German trotting horse who lived during the early 1900's. He astounded audiences by pawing the ground, shaking his head, or picking up colored rags to answer complicated mathematical problems, to read, and to answer verbal questions. His trainer, Mr. Von Osten, was a former high school teacher, and he believed that the classroom techniques he utilized (e.g., blackboards and flashcards) were the explanation for his horse's phenomenal performances. It took a German experimental psychologist, Oskar Pfungst, to solve the mystery by applying a double blind experiment. Clever Hans was not a clever mathematician; he was clever at reading subtle, unintentional body cues

from his trainer or audiences. Body inclination, head nods, and so on, all prompted Clever Hans to begin or end his behavior.

The "Clever Hans Phenomenon," is a serious threat to the validity of animal behavior research. On the other hand, I am convinced that a sufficient number of well controlled studies on higher intelligence in animals have been performed to permit the above findings on cognition and language to stand. But whether or not my interpretation of these studies is valid is irrelevant to my methodological critique following. That is, in spite of the impressive performances of higher animals in such areas as problem solving and language, we still have not assessed the intellectual potential of these animals, because we have not ensured equivalence in our research techniques.

Cross-Cultural Methodological Critique

It is time for a conceptual shift. The dominant model for studying higher intelligence in animals has been the Cognitive Model, in which our human experience provides the reference points and the standards against which animal performance is evaluated. Rather than assessing animal intelligence from this Cognitive Model, consider the same assessment from a Cross-Cultural Model, in which we cross the ultimate in cultural boundaries. We cross species boundaries.

A major dilemma in human cross-cultural research is ignorance of the mind of the other; and a basic principle following from this is that we assume cross-cultural data to be

interpretable to the extent to which the backgrounds of the researcher and those being studied are similar (Malpass, 1977). In fact, much of cross-cultural research is criticized for being pseudoetic; our emic assessment techniques are assumed to be etic (Triandis, Malpass, & Davidson, 1973). We enter another culture and assess how They perform according to Our categories of understanding, rather than how They perform according to Their categories of understanding.

Permit me to illustrate first with a human example. Some years ago, I was privileged to meet Lacondon Indians in the jungles of Chiapas. Both men and women were wearing their unadorned, plain gowns; both were wearing their black hair long. These Lacondon were direct descendants of the Indians of the Mayan Empire. Up until recently, many of these Lacondon were so isolated that their pantheon of Lacandon gods and their rituals, their stone carvings and shrines, were uninfluenced by Western culture and Western Christianity (Perera & Bruce, 1982). Truly, we were culturally alien to each other.

For the purpose of this illustration, you have joined me to assess the intelligence of these Lacandon Mayan Indians. Not surprisingly, we encounter numerous methodological difficulties. In the course of our assessment we ask the question, "What is the meaning of this proverb: Lay aside money for a rainy day?" (This, by the way, is similar to one type of item on the Stanford-Binet Intelligence Scale.) Our first methodological problem is language inequivalence, so we directly translate the words into Lacandon. Our next methodological problem is that a word for word translation does not ensure equivalent

deep structure meaning in the translated sentence. This is a conceptual methodological problem. For example, "money" and "rainy day" to Lacandon Indians are not conceptually equivalent to "money" and "rainy day" to Western North Americans. A third methodological problem exists in the measurement process itself. In other words, given some Lacandon answer to our question, there may be no indicators in their response which are comparable to Western North American indicators. Are they showing much, moderate, or little intelligence in their answer? Finally, a methodological problem exists in response style. For example, Lacandon Indians may show a different level of loquacity in their response, not because of differences in intelligence, but because of cultural values. Equivalence of response, equivalence in measurement, conceptual equivalence, and linguistic equivalence, all are essential and all are elusive in human-human comparative research (Warwick & Lininger, 1975). The ultimate goal in such comparative study is "dynamic equivalence" (Kraft, 1977, p. 190); this means that the understanding and type of response in the culture being researched is essentially equivalent to that produced in the researcher's own culture.

Equivalence of response, equivalence in measurement, conceptual equivalence, and linguistic equivalence (or equivalence in communication), are also essential elements in human-animal comparative research; however, little attempt is made to ensure these equivalencies (Sarles, 1969; 1982). Three implications emerge from this recognition. First, our conclusions on problem solving, language acquisition, and so on, in higher animals are inadequate. Second, the performances of higher animals on problem solving and language

tasks are even more remarkable given that they are forced to perform under pseudoetic conditions. That is, They are performing according to Our categories of understanding. Third, in order to accurately ascertain higher intellectual functions in animals, we must enter into their realities and understand their world views.

World Views of Animals

Before we can consider the world views of animals, we must define the term within its more common context--the human. World view is a people's basic model of reality; it includes what reality can or should be; and it organizes the conceptual system and behavior of members of a culture (Kraft, 1979). World view includes our relationship to the natural environment, our physical development, our cognitive development, and experience. World views differ from culture to culture.

> To our way of thinking the Indian's symbol is the circle, the hoop. Nature wants things to be round. The bodies of human beings and animals have no corners...The moon, the horizon, the rainbow--circles within circles, with no beginning and no end...Our circle is timeless, flowing; it is new life emerging from death--life winning out over death.
>
> The white man's symbol is the square. Square is his house, his office buildings with walls that separate people from one another... Square are the white man's gadgets...These all have corners and sharp edges--points in time, white man's time, with appointments, time clocks and rush hours--that's what corners mean to me (Lame Deer & Erdoes, 1972, pp. 112-113).

We can never truly experience the world view of another culture, although we may understand a verbal description of that world view by making comparisons to our own experience. Language is central to the organizing and communicating of human world views. What is central to the world view of creatures for whom human-like language is irrelevant?

Nagel (1974) tangentially addresses the difficulty of answering this question in a philosophical exercise regarding consciousness. "An organism has conscious mental states if and only if there is something that it is like to be that organism--something it is like for the organism" (p. 436). Using the bat as an example, Nagel discusses the process of imagining webbing on one's arms, hanging upside down, and flying while perceiving one's world through a system of echolocation; however, this imagining describes only what it would be like for a person to behave as a bat behaves, not what it is like for a bat to be a bat. In a reversal of perspectives, an intelligent bat would be at a similar disadvantage, if it attempted to form a conception of what it is like to be a human. The structure of its mind, and its resultant world view, might limit its understandings of what humanness is like to concepts common to both species, perhaps visual perception and appetite. We, of course, would know how terribly inadequate its understanding was, because "we know what it is like to be us" (Nagel, 1974, p. 440).

Consider the world view of the bottlenose dolphin. When we think of dolphin we probably visualize the animal with its head bobbing above the water, chattering, squawking,

and whistling. This of course is how the public is exposed to dolphin at oceanariums, and how research on dolphin cognitive processes often is performed. This conception reflects an "anthropogenous" dolphin; that is, a dolphin which has spent so much time with humans, that its behavior no longer reflects its natural state (Hediger, 1981). What is the natural reality of the dolphin? A 360 degree world of diffuse light, in which gravity is less evident. Constant three dimensional imaging occurs through sonar echoes displaying the surrounding physical and biological environment. Environmental sounds are mixed with sonic beams of varying length, frequency content, intensity, and directionality from companion dolphin communicating their echo perceptions, their movement, their emotions (see Herman & Tavolga, 1980; Johnson, 1986). How very different from our 120 degree world of visual perception, dominating gravity, and language.

The bottlenose dolphin possesses a large, convoluted, complex brain (Morgane, 1978; Ridgway, 1986). More relevant to the present discussion, the bottlenose dolphin shares with humans the highest level of encephalization; that is, enlargement of the brain beyond that expected to meet basic bodily and species survival needs (Jerison, 1978; 1985). Encephalization is a measure of information processing capacity, independent of how that capacity is utilized; therefore, encephalization is an indicator of intelligences. This concept of intelligences extends beyond the interpretation that intelligence is demonstrated in all animals which are adaptable and flexible within their ecological niche (e.g., Breland-Bailey, 1986). Encephalization, at least in mammals, likely is correlated with enhanced perceptual and cognitive processing. The more encephalization in the brain, the more

complex the organization of a hierarchically organized information processing system. These enhancements or intelligences are manifested across species by radically different adaptations. For example, through regression analyses, we can predict that a wolf and a crow are equal in encephalization and of comparable intelligences; however, the manifestations of their intelligences are obviously very different (Jerison, 1985). It is hypothesized that upon reaching some level of encephalization, rather than simply analyzing and responding to events, brains begin to handle information by creating a representation of reality within which events make sense. Within the human species, language is associated with encephalization. Language of course is not simply a vocal signal system with a limited acoustic range, it is intimately linked with cognition. "Our linguistic world is a unique reality-creating world" (Jerison, 1985, p. 31). For instance, think of the times we have lost ourselves in the worlds of fictional writing. Given this possible link between the human species, encephalization, and language, it is reasonable to expect that other highly encephalized animals may also have equally complex adaptations for constructing realities, but adaptations very different from our experience.

Returning to the bottlenose dolphin. In what way does its highly encephalized brain relate to its perceptual and cognitive world? One reasonable hypothesis is that its encephalization results in an enhanced echolocation system which can be conceived as the counterpart to language in humans (Jerison, 1986). This is not human-like language through a different medium; it is an equally complex, but dramatically alien means of "knowing" dolphin reality.

In a fascinating, speculative chapter, neuroscientist Jerison (1986) contrasts the human experience to what may be the dolphin experience. For the human, an object may be more an object when it is seen or cognitively visualized; for the dolphin, an object may be more an object when it is heard or cognitively auralized. For the human, language is basic to communication and cognition; for the dolphin, echolocation is basic to communication and cognition. For the human, language is the medium for sharing consciousness; individuals describe their personal experiences to each other. For the dolphin, with its ability to intercept the auditory signals of conspecifics, sharing consciousness may be more intimate. Dolphin may share with each other "raw" sensory data. (The human parallel may be directly experiencing the visual world of another; i.e., seeing through another's eyes.) In other words, a communal cognition or consciousness may be the dolphin's experience. This leads to a final hypothesis. For the human, language is foundational to a self concept that is individualistic, which includes private experience. For the dolphin, with the possibility of communal consciousness, there is also the possibility of a communal sense of self.

All the preceding is speculation, reasoned speculation, but speculation none-the-less. We simply do not know what the reality is, what the world view is of dolphin or any other non-human species. In fact, we never will know. What is important is that we recognize the quite reasonable possibility that such nonhuman world views exist.

Implications

In closing, I will raise three implications from the previous analyses. The first relates to humility; the second relates to spiritual realities of animals, and the third relates to respect and care for all God's creatures.

We do not know, and we never will know what are the realities of nonhuman species. My first implication returns us to the introduction of this manuscript. We as a human species need essential humility in our structuring and utilizing of human and animal categories. We simply do not know what parameters are relevant to understanding the realities of the nonhuman.

Second,

> Remember the poor old blundering Saint Mael, whose eyesight was so poor that he mistook a tribe of penguins for a lot of gentle savages, and proceeded to baptize them forthwith. Which the chronicler tells us, put heaven in a great predicament: How were the souls of penguins to be received at the right hand of God? A council of archangels decided that the only way out of the quandary was to change them into men. Which was done. Whereupon all those poor penguins ceased sinning in innocence, and were well and truly damned (Vercors, 1953, p. 64).

Our assumptions about the intellectual realities of animals are flawed by 1) speciescentric presuppositions, 2) methodologies which inadequately control for cross-cultural (i.e., cross-

species) inequivalencies, and 3) a basic epistemological problem, in that how we know is intimately tied to our experience and our experience is interpreted within our world views and our world views are distinctively human. Our assumptions about the spiritual realities of animals are similarly flawed; I believe this is particularly so for Western Christians who place so great an emphasis on the human language based revelation of God, the Bible. It should not be surprising that God's language based revelation focuses almost exclusively on humanity's spiritual status and humanity's needs and humanity's responses to God's intervention. The lack of language based information on the spiritual reality of the remainder of God's creation does not imply that such spiritual reality is nonexistent. Recall the example of the profoundly mentally retarded person earlier in this manuscript. Would any of you argue that since this person lacks language and has no intellectual understanding of God, this person is bereft of spirituality? It appears quite reasonable to assume, particularly in highly encephalized animals, that spiritual realities relevant to their world views exist--that in the alien world of the dolphin, for instance, dolphin are in relationship with their Creator.

Our discomfort with the possibility of animal spiritual realities is a reflection of our cultural world view. Religion is a folk category of Western culture and language; it certainly is not a human universal, although spirituality is. In much of the history of humankind, and in much of the non-Western world today, spirituality permeates all of human experience; it is not relegated to that one aspect of our lives labeled religion. In this broader cultural context, the natural/supernatural distinction makes no sense, and thus

the natural world of animals flows with the supernatural.

Given our cultural context and my speculation on animal spiritual realities, an apparent conflict is the Genesis 1 account of humankind being created in God's image. I agree with John Calvin in 1559 and more recently with Berkouwer (1962), that this expression is "rather obscure" (McNeill, 1960, p. 188). Theologians such as Berkhof (1941) and Strong (1907), for example, have considered God's image to include such spiritual qualities as true knowledge, righteousness, and holiness (all corrupted in the fall), and a variety of the intellectual qualities we discussed earlier under the Cognitive Model. Spiritual qualities like holiness are difficult to operationalize in human terms, let alone non-human terms, and the intellectual qualities selected for inclusion in God's image reflect a type of circular reasoning. The reasoning begins with the premise that a qualitative distinction between human and animal does exist. This is followed by a search for examples to substantiate the premise, e.g., animals do not communicate with symbols. These descriptions then become explanations for qualitative distinction, e.g., the reason that humans are qualitatively distinct from animals is that humans alone can use language. The history of such reasoning is one in which these so-called "foundational criteria" have fallen one after the other, and proponents of the qualitative distinction find themselves scrambling for a new example which "truly" separates human from animal. Currently with the "language utilization" criterion becoming more and more shaky, other criteria are being raised as foundational. Moral Conscience? Anecdotal evidence exists in language trained apes for preconventional moral reasoning (e.g., Patterson, 1978); this is characteristic of

human children. Knowledge of one's own mortality? This is more difficult to demonstrate; however, language trained apes have demonstrated grief reactions to being told symbolically (i.e., in sign language) that a loved one had died (e.g., Washoe at the death of her infant (Fouts et al., 1982); Koko at the death of her kitten (Vessels, 1985; Zimmerman, 1985)). This type of search appears futile, at least within the domain of the cognitive model. Sarles (1982) went a step further and condemned the motivation for this search as our need to justify our animal exploitation; we are compelled to find domains where we are qualitatively superior to animals.

Assuming that God's image truly does set the human species apart from animal species, then again I agree with John Calvin, that to understand what qualities constitute the image of God, we must look at those qualities in their restored state through Jesus Christ. In fact, we can look to Christ as the archetype (Berkouwer, 1962). I will develop this further in my third implication below. Now before you relax back into speciescentrism, I hasten to add that even if God's image is a distinctive of humankind, this does not imply that spiritual realities are beyond the experience of animals. We simply do not know.

Third, in addition to God's language based revelation is the more widely accessible revelation of God's creation. Approaching creation with greater humility, and recognizing the possibility of animal spiritual realities parallel to our own should lead us to a heightened respect for God's non-human creation in general, and God's non-human creatures in particular. Likewise, to walk as Christ walked, to love selflessly, to submit

ourselves one to another, i.e., to demonstrate God's image in us, should lead to the greatest of care for all God's creation, human and non-human.[3] This is recognized by many who do not premise their arguments on religious traditions. For example, neurosphysiologist and specialist in whale nervous systems Peter Morgane wrote:

> We certainly need an entirely different and perhaps more mystical [emphasis mine] concept of beings with whom we share this planet... They are caught up with ourselves in the web of life and time and are fellow prisoners of the splendour and travail of the earth. If we recognize them in this form perhaps many of our views may yet be changed before it is too late (Morgane, 1978, p. 216).

Unfortunately, the recent history in Western society is one of progressive isolation of humankind physically from nature (Rensberger, 1978), and this is coupled with a Judeo-Christian philosophical/theological orientation that separates nature from God, and humanity from nature, as well (Black, 1970). To "have dominion" (Hebrew: rada) and to "subdue" (Hebrew: kabas), have been interpreted as humankind in absolute command over nature, as in subjugation (Black, 1970). However, both the context of Genesis 1 and the clarification of Genesis 2 mitigate against such a view. Genesis 2 indicates that nature is to be enjoyed (i.e., in Rensberger's (1978) aesthetic sense), as well as to be the source

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[3]Although beyond the scope of this manuscript, attitudes of respect and care for all God's creatures clearly cannot coexist with animal exploitation, unprincipled animal experimentation, habitat destruction, environmental pollution, and so on.

of nourishment. Humankind is to manage the garden for God. Both Genesis 1 and 2 are in the pre-fall, paradise time period; thus, dominion in these passages is in a context similar to that described in Isaiah 11. God's plan is for peace to exist in the animal world, and for peace to exist between animals and humans. Humankind is the steward or manager of God's creation--a shepherd king in the manner described by Psalm 23 (Barr, 1972). Similarly, Granberg-Michaelson (1982) has argued that in the Biblical account of the flood, when God lifted "the curse" in Genesis 8, God instituted a change in how human and non-human creation were to relate to each other. "Subdue" was no longer a part of God's blessing of humankind (Genesis 9:1 and 9:7), and God's covenant in Genesis 8 and 9 included with humankind, all living things. Likewise, redemption through Jesus Christ was not limited to humankind, although this is how Western Christianity has interpreted God's stepping into history. In John 3:16, God so loved the cosmos; that is, the world and all its inhabitants. We need not resort to metaphor to interpret Psalm 148. Sun, moon, stars of light, dragons, and all deeps, mountains, trees, beasts, creeping things, flying fowl, and humankind praise God, for God's glory is above the earth and heaven.

I will close this third implication and the manuscript with a closer look at humanity's role in the natural world, using Peacocke's (1979) thoughtful descriptions. In additional to shepherd king, humankind is also a priest of creation. Creation is sacramental, i.e., set aside for God's purposes. Humankind is symbiont, displaying reverence for creation because of the interdependence of all facets of nature. Humankind is prophet, lover,

preserver of creation. God communicates Godself in nature, and we as prophets interpret and proclaim. As lovers and preservers, we permit nature its full personhood. Humankind is co-creator, co-worker, and co-explorer with God the creator. Here creation is vividly described as an ongoing dance lead by God in which the choreography is still being elaborated. A spirit of delight and play and discovery is a part of this conception. Humans create; what we create should integrate harmoniously with what God is already doing. Finally, humankind is a fellow-sufferer in creation. Adequate interrelation of nature and humanity requires some cost to humanity. Individual and community selfish ends may need to be sacrificed for communion with God's creation. This is the Biblical idea of submission.

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